Quality in Conference Publishing

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***Abstract*—*The rapid growth in the number of conferences and papers appearing in conference proceedings publications has increased the need to examine the issue of conference paper quality. Since conference content is included in permanent repositories, such as IEEE's Xplore, the existence of low-quality papers in a conference will degrade the value and reputation of the conference and the repository. The aim of this contribution is to consider these issues from the point of view of the Conference Publications Operations Committee of the IEEE Computer Society, and offer ideas that could lead to improved conference publishing quality for all IEEE societies and even non-IEEE entities.*

***Index Terms*—*Conference paper quality, conference proceedings, quality.*

The IEEE Computer Society's Conference Publications Operations Committee (CPOC) is described in its charter as an oversight body for all Computer Society conference publishing products. Responsibilities include the overall oversight of program direction, service portfolio, intellectual-property issues, pricing, and revenue sharing. This committee also has oversight for overall program operations. This committee may function in a research mode, where prototype products are tested for decisions on future activities and are based on test results, market data, as well as committee input and response. In essence, this body acts as a board of directors for the Computer Society's Publications Operations.

When the IEEE Computer Society's Publications office agrees to produce conference proceedings through its conference publications program, the intellectual content of the conference is harvested and added to the intellectual property available from the IEEE Computer Society's digital library (CSDL). By extension, it is also available on the IEEE Xplore digital library. The quality of the conference proceedings is therefore an important issue. The IEEE exists for several reasons, including to help further research in its members' fields of interest. Poor-quality conferences cannot serve this purpose. When plagiarized papers, duplicate papers, and poor-quality papers from conference proceedings are included in Xplore, Xplore's value as a tool for researchers is reduced and the IEEE's reputation suffers.

Quality in IEEE publishing is governed by the IEEE Publication Services and Products Board (PSPB) Operations Manual (Ops Manual) [1]. There are certain rules in the PSPB Ops Manual that ensure that the contents of serial publications are of an acceptable level of quality. For example, one of the rules states that any paper appearing in an IEEE serial publication has to have at least two positive referee reports. Conferences are not strictly considered serial publications under these rules and, therefore, the PSPB Ops Manual rules regarding refereeing do not need to be applied (although they should be). Therefore, even if a conference is sponsored by the IEEE, it cannot be assumed that the refereeing standards are the same as the standards of IEEE journals.

For more than a year, the CPOC has been working on establishing best practices for conference publishing with the goal of encouraging more consistent quality across all conference publications. In this paper, we review the motivations for these efforts, explore the notions of "good" conferences and conference publications, and introduce a simulation

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model to improve understanding of the effects of conference acceptance rates on future submissions. A preliminary version of the CPOC's recommendations for quality is presented later.

A Conference and Its Proceedings Conferences are essential vehicles for most academic disciplines. The primary aim of a conference is to disseminate new research results in a congenial setting. The in-person experience of the conference also adds essential human interaction among attendees. This interaction goes beyond the dry scientific discourse, which can occur through any suitable medium (for example, the internet, magazines, and newsletters). The unique feature in this context is that conferences provide a forum for new researchers to make personal contacts with established researchers and industry practitioners and for established individuals to revisit and renew previous personal contacts. Furthermore, conferences can serve as synchronization mechanisms for scholarly societies in conjunction with annual meetings and other organizing activities.

A technical conference will normally yield a publication, usually called the "proceedings." The proceedings contains the text of papers presented at the conference and often the summaries of presentations made by plenary or keynote speakers and ephemeral material related to the conference. Conference proceedings may appear in print, electronically, or both.

In some disciplines, conference presentations are accepted and scheduled purely on the basis of short abstracts or position papers, and these form the contents of the proceedings, though in some cases, the extended paper may appear later. This situation is not usually the norm in technical disciplines.

Within a conference session, each presenter delivers a talk based on the corresponding conference proceedings paper. If attendees want to know more about the presentation material, they can consult the proceedings. A particular advantage of a good conference is that the attendees may also speak directly to the presenter to explore further details of the talk. Such conversations often provide insights that are not available through solitary reading.

The conference publication also constitutes a permanent record of what was presented at the conference and, as such, it can be consulted in the future. In any case, papers that appear in proceedings have archival status very similar to journal articles.

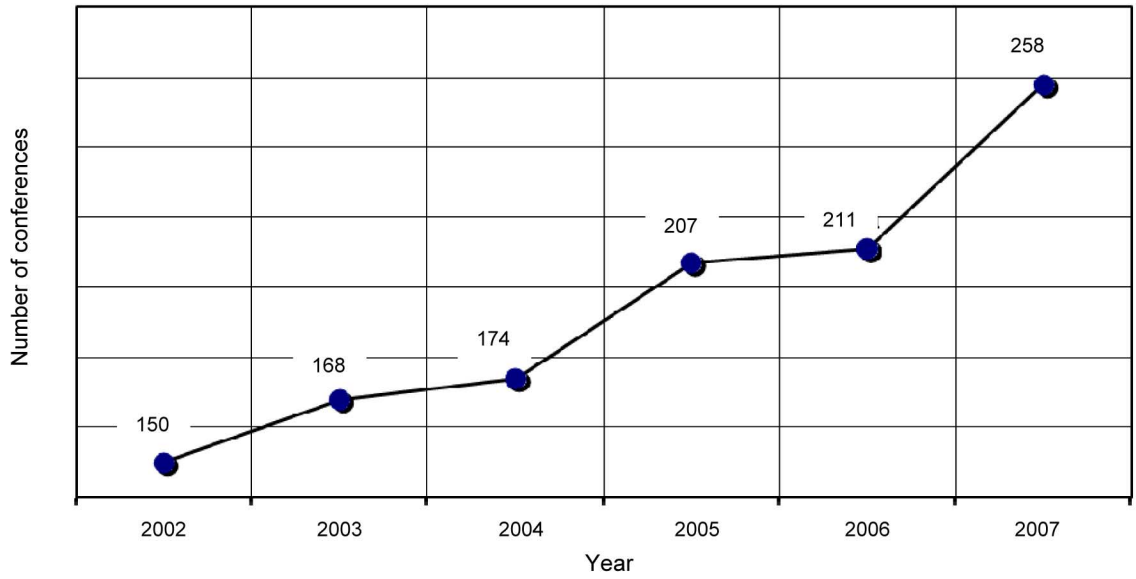
Growth in the Number of Conferences The number of conferences served by the IEEE Computer Society's Conference Publishing Services (CPS), which publishes proceedings for the conferences sponsored by the IEEE Computer Society, other IEEE Societies, and selected non-IEEE entities, is growing rapidly. The number of conference proceedings published by CPS has increased by 72% over a five-year period from 150 to more than 250. (See Fig. 1.) The Computer Society forecasts continued growth in the number of conference proceedings that it will publish.

As the number of conferences involved increases, however, so too does the risk that one or more will be perceived as "low quality." In order to mitigate this risk, the Computer Society determined that it was imperative to address the issue of conference publishing quality. In discussing conference publishing quality, two primary issues must be addressed: 1) What is a good conference paper? and 2) What is a good conference?

WHAT IS A "GOOD" CONFERENCE PAPER?

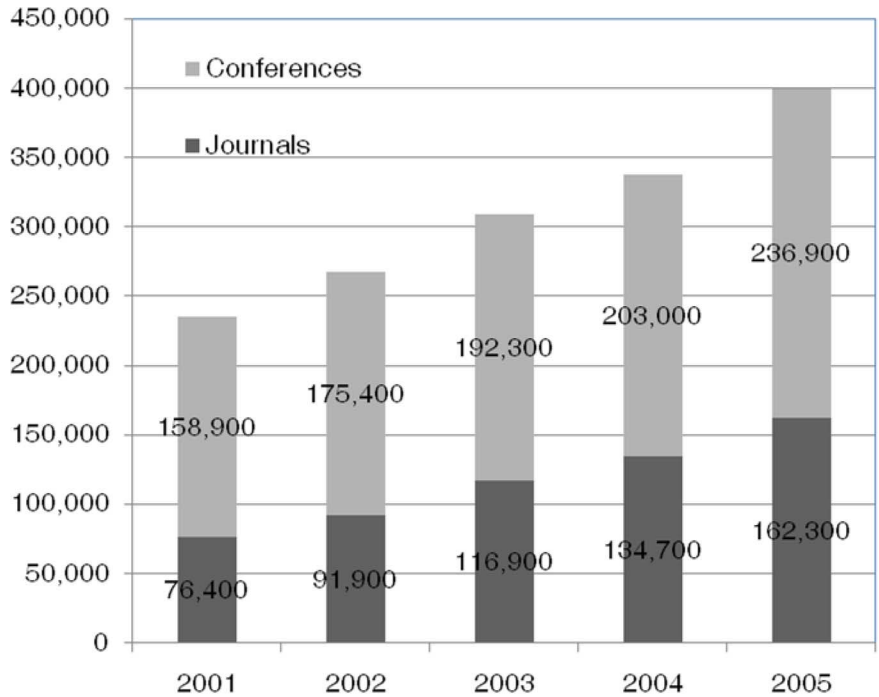
The quality of a single paper published in a journal or peer-reviewed magazine is often judged by reference to the quality of the publication venue—at least for the adjudication of tenure and promotion decisions in academic settings. A journal or magazine can be rated through traditional, quantitative publishing metrics, such as impact factor, citation half-life, and immediacy index. But these metrics are not traditionally used to rate the quality of a conference proceedings. Lowry, Humphreys, Malwitz, and Nix found that when rating the quality of business and technical communication journals by different groups, differences by world region and academic department type were found in the rankings [2], illustrating that quantitative metrics are not consistently regarded. Therefore, other ways of identifying a good conference paper are needed.

Citation Count as a Measure of Conference Paper Quality One quality consideration is based on the general principle that a good conference paper will be frequently cited by top journals, and/or it eventually will be used to generate a high-level journal paper. It is not naïve to believe that conference papers can be as frequently cited as journal papers. In fact, citations for IEEE conference publications grew faster than those of journals between 2001 and 2005 (Fig. 2).



Note: The number of conferences whose proceedings are published by the IEEE Computer Society's Conference Publishing Services rose 72% from 2002 through 2007. This data includes 2002 through 2007 IEEE International Professional Communications Conference (IPCC) proceedings.

Fig. 1. Number of conferences whose proceedings are published by the IEEE Computer Society's Conference Publishing Services.



Note: Over a five year period all citations rose from 158,900 to 236,900 (49%), but conference paper citations grew from 76,400 to 162,300 (112.3%).

Fig. 2. Citations for IEEE conferences based on findings of an ISI Thomson Citation Report from 2001 through 2005.

Therefore, the measurement of citations of conference papers in high-quality journals could provide an indication of paper quality. This measurement, however, can be only performed a posteriori and often a long time after publication in the proceedings.

But the efficacy of the citation count is the subject of a great deal of debate [3]. One issue is how easily this metric can be artificially inflated. For example, members of a research community can explicitly reference each other's work in a quid pro quo fashion. Authors of conference publications can potentially manipulate citation statistics more easily because of the frequency of interaction within the closed community. Finally, there are conferences in which a major segment of the audience consists of practitioners; for these conferences, citations are not necessarily the right metric.

Paper Migration to Journals as a Measure of Quality The direct migration of contributions from conference publications to highly ranked journals is a possible means to indicate the quality of papers and, as a consequence, of conferences as well. With direct migration, the conference inherits and contributes to the journal's reputation. The PSPB Ops Manual, however, requires that any conference publication subsequently appearing in an IEEE journal must contain at least 30% new material. Therefore, an additional editorial process between the conference and journal acceptance is required.

An alternative solution with respect to direct migration could be for a committee (for example, peer reviewers) to evaluate the quality of conference papers from the viewpoint of parameters, such as citation index, impact factor, and immediacy factor. Lowry et al. discuss these metrics in depth [2]. This approach applies, however, only when the conference in question is related to some well-known, high-level journals. Counting conference papers cited inside high-level journals is certainly an approximate measure. Even if this count is not comprehensive, it could lead to less-biased and more-stable conclusions because it avoids conference self-citations and is related to the reputation of high-level journals.

Relative Measures of Conference Paper Quality There are, of course, relative measures of a "good" paper between one conference and another since there are also variations in quality among conferences within a specific field. In some fields, conferences are rank ordered (e.g., tier 1, tier 2). It therefore might be the case that only papers appearing in the so-called tier 1 conferences will have acceptable status (with respect to tenure and promotion at a university, for example). The status of papers in a tier 1 conference might even be perceived to be "higher" than papers in any of the journals in a specific subfield.

Qualitative Measures of Conference Paper Quality There are qualitative measurements used by several conferences that acknowledge the most interesting contributions through prizes, such as the best student contribution or best paper award. The evaluation standards, which stem from sets of objective and subjective criteria, are particular to the conference and used to compare already-accepted papers. Although generated by conference organizers, these awards are commonly recognized inside the scientific community when the reputation of the conference is perceived to be good.

A major shortcoming of qualitative measures, however, is that it is very difficult to apply them consistently over time, across changing evaluation committees, and among different conferences. Another major disadvantage is that the number of papers so recognized per conference is severely limited, though many papers at the conference could be of significant quality.

WHAT IS A "GOOD" CONFERENCE?

The perceived quality of a paper is, in general, strongly related to the quality level of the conference. Conversely, the conference is associated with the quality of its papers. There are two main reasons for the correlation. First, the perceived quality of the conference's reputation can depend on the relevance of its papers. Second, it is possible that an author will submit his or her work only to a conference of equal or higher relevance than the perceived quality of his or her submission.

Assessing Conference "Goodness" To assess whether a conference is good, a measure of "goodness" must exist. Without knowing the attributes of goodness, such an assessment is problematic. Although various metrics have been proposed for benchmarking conference quality, the process remains as an inexact science. Some of the de facto standards include accepted-paper-to-attendee ratio, paper acceptance rates, and reputation of program committee members, reviewers, presenters (based on the number of papers published), and attendees. None of these measures, however, has been generally accepted as the unique quality measure for conferences.

Another way to rate a conference is based on the opinions of researchers in the field (according to surveys, for example). Another measure could be the acceptability of contributions in

the proceedings, as evidence of scholarship in evaluating funded research, tenure, and promotion portfolios. For example, some grant-making agencies may consider papers published in a particularly rigorous conference to be a key element in a successful research proposal.

Paper Acceptance Rate as a Measure of Conference Quality Paper acceptance rates are often proffered as a measure of the quality of a conference (and often of journals). But no standard exists for the proper acceptance rate for a conference, or for journals, for that matter. The issue is murky because without considering the circumstances of the conference, an acceptance rate alone is an insufficient metric to judge quality. For example, a 100% acceptance rate for a conference, prima facie, signals a low-quality conference unless the conference involves only Nobel Prize winners, in which case, a near 100% acceptance rate would be expected. Clearly, a near 0% acceptance rate would mean the end of the viability of a conference. However, if a high percentage of the papers submitted to a new conference were poor (perhaps because the mission of the conference was not clearly articulated), it might be more judicious to simply postpone or cancel the conference, (a de facto 0% acceptance rate) rather than proceed with a set of poor papers. Any acceptance rate can be questioned as being too high or too low. Is a 50% acceptance rate appropriate if 90% of the papers are actually "excellent" by whatever rating system is being used? Is 30% unacceptable if a large portion of the papers submitted are quite bad? These questions cannot be answered in the hypothetical sense.

The incentive to accept all papers submitted to a conference is often motivated by economics. It has become an increasingly common practice among even the most highly prestigious events to insist that authors of accepted papers "preregister" for the event to ensure that they intend to show up and present their work. This requirement is due to an increasing number of authors who fail to show up at conferences, sometimes seriously hurting the program and the overall reputation of an event. A similar effect occurs when authors show up at the conference only to present the papers and then disappear, thus losing the benefits of the face-to-face dialog that enrich the conference and lessening the conference experience for others.

These "absentee" authors see conferences only as economical and timely avenues of publishing without regard to how the program is received by attendees. The social contract generated between authors and conference organizers when a paper is accepted for presentation no longer seems to be enough to ensure the quality of a program. Low-quality conferences will often take advantage of this new registration practice, requiring authors to pay a substantial advance registration fee to have their papers included in the publication. The income for these conferences is therefore linked to the number of papers appearing in the proceedings, leading to acceptance rates often approaching 100%.

Unfortunately, some authors are willing to pay registration fees to be published, despite the fact that they do not intend to attend the conference to present their work. This situation may shorten the lifespan of these low-quality conferences as disappointed attendees seek other venues. Regrettably, this state of affairs causes more work for high-quality conferences since the organizers now have to reevaluate how they plan their programs and choose presentation-level papers. A side effect of this situation is that the proceedings of a conference, being a record of the conference, cannot be produced ahead of time and still be accurate. Finally, when no-show-presenter papers are included in preproduced proceedings, the question arises as to whether such papers should be included in the repositories or not. These issues are being thoroughly debated in the IEEE.

Aside from the contextual issues surrounding paper acceptance rates, the impact of perception on future submissions can be quite high, as can be demonstrated through simulation. Such a simulation model for the perceived effect of acceptance rate on attendance will be given.

Absence of Objective, Standard Conference-Quality Metrics The absence of standard conference-quality metrics reflects results with significant disadvantages to authors, attendees, reviewers, and conference organizers. Due to this void, the quality of conference publications is often addressed through a subjective evaluation, based on committee members' experience, background, and vision, and in some cases, by simply counting the number of papers and conference publications without regard to perceived quality. Unfortunately, as a result of imperfect measurement, inferior conferences occur with regularity [4]. Without measurable evaluation standards, it is likely that inferior conferences will continue to emerge and exist.

SIMULATING THE EFFECTS OF ACCEPTANCE RATE ON FUTURE SUBMISSIONS

In technical disciplines, authors of conference papers are often graduate students or young faculty looking to establish their academic credentials in the topical community served by the conference. Paper submissions also come from established industrial or academic scholars. What is not known is whether the paper acceptance rate of a conference acts as a deterrent to or as an incentive for future paper submissions to that conference.

Perception of Acceptance Rate on Future Submissions Conferences frequently publish their acceptance rates, or the information can be obtained through communication with the conference organizers, or it can even be estimated by communicating with enough individuals who also submitted papers to the conference. It is possible that at least some portion of the community served by a conference will be encouraged to submit papers based on the likelihood that the paper will be accepted. That is, the higher the acceptance rate is, the more likely that current and new researchers in the field will submit papers to the conference the following year. Some of the motivation for linking the acceptance rate to future submissions is understandable—no one likes to have a paper rejected. But often conference attendees are looking for a mechanism to attend the conference for the purposes of sustaining their research network, and many companies and universities require that a paper be accepted at the conference for travel funds and registration fees to be provided. In other cases, the conference is being held in an attractive location, or in conjunction with some other desirable event (such as a trade show), increasing the rewards for paper acceptance. Indeed, if the desire to attend a conference was based on the reputation of the conference alone, there would be no need to hold conferences in exotic locations, as is sometimes the case.

Whether paper acceptance rates have an effect on future submissions is an open question. However, if it can be shown that such a causal mechanism exists, then the implications are profound.

Simulation of Acceptance Rate Perception on Future Submissions To illustrate the potential volatility of an acceptance rate on future submissions, consider the following simple simulation model. Note that this model is not intended to provide any kind of predictive capabilities for real conferences. The intent of this model is to show how sensitive future submissions are to acceptance rates and whether prospective authors use acceptance rates as a factor when considering whether to submit a paper to a conference.

Assume that for a particular conference, there are n submissions in a baseline year y_i, $i \geq 1$. Assume that submissions in year $y_i + 1$ are linearly influenced by the acceptance rate in the preceding year, such that if the acceptance rate r is less than some rate r_{low}, fewer papers are submitted in year $y_i + 1$. This situation can be modeled as in

$$y_{i+1} = \max\left(0, y_i + y_i(r - r_{\text{low}})\right). \tag{1}$$

Equation (1) says that the increase of submissions of one year with respect to the submissions of the previous year (i.e., y_i) is a linear function $y_i(r - r_{\text{low}})$ depending on the previous year's submissions y_i and on the increase of accepted papers r with respect to a minimum reference value denoted as r_{low}. The max (0, ...) function in (1) is required to avoid the mathematical case of obtaining a negative number for $y_i + 1$ when the acceptance rate r is much smaller than r_{low}.

The effect is that when the acceptance rate is larger than a reference value r_{low} (i.e., when $r > r_{\text{low}}$), the increase of submissions [i.e., the term $y_i(r - r_{\text{low}})$ on the right side of (1)] is positive. Alternatively, when the acceptance rate is smaller than r_{low} (i.e., $r < r_{\text{low}}$), then there is a decrease in submissions. When the acceptance rate is equal to the reference value (i.e., $r = r_{\text{low}}$), then the conference submissions will be the same from one year to the next.

It seems reasonable to assume, however, that paper submissions for a conference are not entirely dependent on the perception of the likelihood of acceptance. There is always a certain number of papers—core submissions—from individuals closely involved with the conference. Therefore, it is likely that in year i, C_i papers can be assumed to be submitted from conference committee members, their close associates, invited presenters, and so on. It is likely that C_i is different each year, but for simplicity, assume a constant set of core submissions each year, given by C.

Therefore, the total number of submissions to a conference in year S_i would be given by the values provided by (1) with a positive bias equal to C, for example

$$S_i = y_i + C. \tag{2}$$

Equation (2) improves the rough model of (1) by simply observing that out of all submissions S_i, there is a part C that is not affected by the previous years' acceptance rates, while there is another part y_i that is linearly variable with the acceptance rate of the previous year [i.e., (1)].

To visualize the effect of acceptance rate on future submissions, consider a simple example. Suppose in baseline year y_1 that 200 submissions are made to a conference. Also consider that the conference has a core set of $C = 30$ submissions and a fixed value of $r_{\text{low}} = 50\%$ over the years. Applying (1) and (2) to these data across acceptance rates r of 20%, 30%, 40%, 50%, 60%, 70%, 80%, and 90% yields the projected paper submissions as shown in Table I.

It is interesting to note from Table I that when the acceptance rate is quite low, for example, 20%, the number of conference submissions quickly degrades to approximately C_i, that is, only the core submissions. Conversely, when the acceptance rate is high, for example, 90%, the growth of conference submissions is exponential, growing in ten years to more than 4,000. This effect is a direct consequence of the linear model used, where it is easily demonstrated that the combined multiplier effect over the years leads to exponential behavior. In fact, given i, the number of years that have passed since the initial issue of the conference, combined applications of (1) lead to

$$\begin{aligned} y_2 &= \max(0, y_1 + y_1(r - r_{\text{low}})) \\ &= \max(0, y_1(1 + r - r_{\text{low}})) \\ y_3 &= \max(0, y_2(1 + r - r_{\text{low}})) \\ &= \max(0, \max(0, y_1(1 + r - r_{\text{low}})) \cdot y_1(1 + r - r_{\text{low}})) \\ &= \max\left(0, \max\left(0, y_1(1 + r - r_{\text{low}})^2\right)\right) \\ &= \max\left(0, y_1(1 + r - r_{\text{low}})^2\right) \end{aligned}$$

and so on, for example

$$y_{i+1} = \max\left(0, y_1(1 + r - r_{\text{low}})^i\right)$$

and therefore

$$S_{i+1} = C + \max\left(0, y_1(1 + r - r_{\text{low}})^i\right). \tag{3}$$

Besides the previous mathematical passages, the interpretation of the results provided by (3) are very important: The submissions $S_i + 1$ at year $(i + 1)$ are the additive result of two terms: (1) a constant term C expressing a contribution that is not affected by the previous years' acceptance rates; and (2) a variable term $y_1(1 + r - r_{\text{low}})^i$ incorporating the cumulative effects over the years of an assessed acceptance rate r with respect to the reference rate r_{low}. This variable term basically shows that the assessment of an acceptance rate over the years has a multiplicative impact, thus leading to exponential behavior over the years (i.e., to the power i outside the bracket).

TABLE I
HYPOTHETICAL EFFECT OF PERCEPTION OF ACCEPTANCE RATES ON FUTURE SUBMISSIONS TO CONFERENCES

	Acceptance Rate							
Year	20%	30%	40%	50%	60%	70%	80%	90%
1	230	230	230	230	230	230	230	230
2	170	190	210	230	250	270	290	310
3	128	158	192	230	272	318	368	422
4	99	132	176	230	296	376	469	579
5	78	112	161	230	323	445	601	798
6	64	96	148	230	352	528	773	1106
7	54	82	136	230	384	627	995	1536
8	46	72	126	230	420	747	1285	2138
9	42	64	116	230	459	890	1661	2982
10	38	57	107	230	502	1062	2151	4162

Again, the max (0, ...) function in (3) is required to avoid the mathematical case of obtaining a negative number for the number of submissions, related to the variable part depending on previous acceptance rates. The effect of the different growth rates is more easily seen in Fig. 3.

By looking at (3) and its derived plot in Fig. 3, we see the breakdown effect.

- If the conference has an assessed acceptance rate r larger than the reference rate r_{low}, then the number of submissions grows exponentially over the years.
- If the acceptance rate is smaller than the reference rate, then the number of submissions decays down to reach only the core submissions C.

We can improve the rough model of (2) further and still observe that the conclusions that can be drawn are similar.

In general, let us assume that in addition to the constant core submissions C, the number of

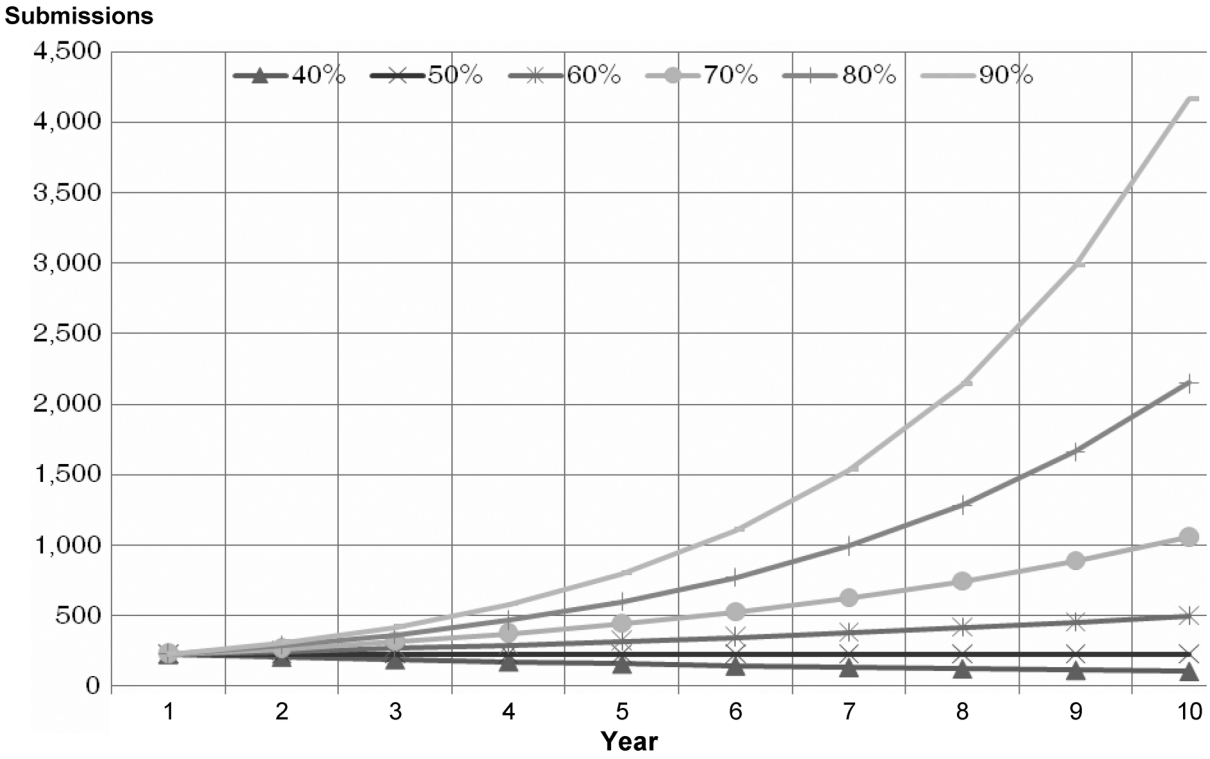


Fig. 3. Hypothetical effect of the perception of acceptance rates on future submissions to conferences based on data from Table I.

submissions in one year is a variable obtained through the multiplication of two variables: 1) the number of submissions in the previous year y_i and 2) a feedback factor of year i, denoted by F_i. In other words

$$S_{i+1} = C + \max(0, y_i \cdot F_i). \tag{4}$$

It can be seen that after a few mathematical manipulations, (4) becomes

$$S_{i+1} = C + \max\left(0, y_1 \cdot \prod_{j=1}^{i} F_j\right). \tag{5}$$

As we saw in (3), (5) also shows that the effects combine through multiplicative history. In fact, in (5), we again obtain the constant term C, and a variable term $y_1 \cdot \prod_{j=1}^{i} F_j$.

In this term, we see that starting from the number of submissions (excluding the core C) to the first instance of the conference (i.e., the value y_1), the effect is multiplicative over the years. That is, one conference is influenced by the nature of the acceptance rates of the previous years, and it will influence (via its acceptance rate) future instances of the same conference.

Therefore, if at some point a conference presents a very low value of F_j, then it could take several years to reach values close to those prior to that critical year. In addition, as (5) models, the "success" of a conference is strongly dependent on previous history.

As a marginal note, it can be observed that if F_j is a constant over the years that is equal to $(1 + r - r_{\text{low}})$, we again obtain (3).

Short Remarks on the Models Although it is reasonable to assume that there is an implicit correlation between the acceptance ratio and the number of submissions in the next year, (2) and (5) represent very simplified models. Even so, the models are useful in gaining a general understanding of the possible behaviors in the submission process for conferences. More complex models could start from (2) and (4) and, say, take into account variable numbers for r and r_{low} by introducing more complex relationships, mixed dependencies on i, and so on. Also, the time window representing the history of a conference could be modeled in a different way, for example, by limiting

TABLE II
PAPER SUBMISSIONS AND ACCEPTANCE RATES FOR THE IEEE VISUALIZATION CONFERENCE [5]

Year	Papers Submitted	Papers Accepted	Acceptance Rate (%)
1994	91	41	45.1
1995	102	41	40.2
1996	101	43	42.6
1997	170	44	25.9
1998	118	50	42.4
1999	129	47	36.4
2000	151	52	34.4
2001	152	51	33.6
2002	172	58	33.7
2003	192	63	32.8
2004	167	46	27.5
2005	268	88	32.8

the range only to the most recent years (e.g., because a new steering committee has been set up).

Even though the model illustrated is entirely hypothetical, it is possible that conferences can be found in which the data fit the model closely. However, these conferences are not likely to advertise high acceptance rates. A sampling of the acceptance rates for computer graphics conferences is in the 20–50% range [5].

Several additional variations can be made with the goal of refining the model provided by (5). However, as can be seen in the next section, there may be cases where the use of (5) is not appropriate. The next section will analyze, in detail, a practical case and show the potential reasons for the unsuitability of (5).

IEEE Visualization Conference Paper acceptance rates do not necessarily adversely affect future submissions, however. For example, the IEEE Visualization Conference clearly does not fit the model of (1) and (2). (See Table II.) The reason is that the perceived quality of this conference becomes the dominant factor over the other potential parameters, including acceptance rates. In other words, there is a prestige factor.

Running the simulation exercise for the Visualization Conference in light of available acceptance statistics makes it possible to frame the definition of a "good" conference as one in which future paper submissions are not dependent on the acceptance rate from previous years. In other words, the acceptance rate is not a dominant parameter. Conversely, a poor conference will see more submissions when acceptance rates are high and fewer submissions when acceptance rates are low. The argument in both cases is based on the assumption that there are authors that are looking for an easy publication. In the former case, easy acceptance leads to future submissions. In the latter case, when denied, the authors avoid the conference from that point on.

CRITICISMS OF THE CONFERENCE "CULTURE"

Conferences and the communities that support them have unique cultures. The cultures associated with a particular research community often shape the perception of the conference and its by-product proceedings. As a human endeavor, conferences are imperfect and can experience difficulties that can lead to reduced stature. Some major problems that conferences experience include the following: stagnancy, polarization, response time, and "low is high."

These problems warrant further description.

Stagnancy Established conferences, while to be applauded for longevity, may become stagnant. Stagnancy may be evidenced by a fixed program committee, nonrotation of conference leadership, too many individuals from the same organizations, countries, or government agencies, and so forth. Of course, there are situations where such homogeneity is appropriate (for example, a NASA-sponsored conference should have many NASA employees involved in the conference). But in general, a lack of diversity and dynamism along certain characteristics of conference organizers indicates stagnancy.

Stagnant conferences can produce an unhealthy social system where membership is the major factor in publication acceptance. Other unacceptable practices in stagnant conferences include pay to play and quid pro quo arrangements. Explicit or implicit destructive pacts may take place (e.g., "If you review my paper favorably, I will do the same for you").

Polarization Conference program committees can become polarized according to intellectual viewpoints or opposing theories. For example, within a certain scientific community, one group might espouse Theory A, and the other Theory B. If the annual conference for this scientific community

is "controlled" by believers in Theory A, then the conference may be effectively closed to espousers of Theory B. This duality almost certainly affects acceptance or rejection of papers outside the accepted theoretical framework.

Response Time Slow response to the authors and conference organizers undermines the quality of the refereeing process, which is often already weak because of the speed with which conference papers must be refereed. While it is becoming increasingly more difficult to find responsive reviewers in many fields, the turnaround time for conference paper decisions needs to be very fast, and systems and tools need to be in place to ensure rapid paper review. One way of accomplishing this, adopted by the Pacific Graphics series of conferences, is to provide complementary copies of the proceedings to the reviewers as a token of appreciation.

"Low Is High" Conference program committees may also suffer from the perception that very low acceptance rates suggest extremely high-quality papers. Thus, low acceptance rates are a bonus, a badge of honor. Perhaps some conferences have become extinct because of such a position. The simulation results previously presented highlight some of the dangers of depending on acceptance rates alone to control the perception of conference quality.

Partial countermeasures to avoid the aforementioned criticisms include blind reviews, expiration times, and turnover of program committee memberships, and combining conferences with special sections of high-level journals. The journals could host extended versions of a conference's accepted papers.

IMPROVING CONFERENCE QUALITY

No general rules for improving the perceived quality and reputation of a conference can be designed or proposed unless the conference organizing committee is committed to enforcing these policies. Taking shortcuts rather than developing repeatable processes is unsustainable. Organizing committees should pay particular attention to conference management, paper evaluation, file quality, and plagiarism detection.

Conference Management Conferences employ a variety of management structures, such as traditional organizing committees, steering committees, and ad-hoc committees. Traditional organizing committees usually involve well-defined roles, such as local arrangements chair, program chair, treasurer, general chair, publicity chair, and so on. This structure can work well when each office holder functions effectively. However, the highly structured nature of each position can become problematic when an office holder does not function effectively. Steering committees are often highly static, providing opportunity for renewal only after someone retires, dies, or quits. But the loosely defined nature of steering committee roles allows for flexibility and for the work of the conference organization to get done despite the shortcomings of any individual member. Ad-hoc committees—those that do not fit either of the previous two models—can provide a convenient framework for conference management. However, by their very nature, they often do not provide a framework that promotes continuous quality monitoring or improvement for future conferences. The quality of a conference can often be tied to which of these management styles is chosen and the effectiveness of the management style when applied, as Voas discusses [6].

Conferences are minibusinesses that are frequently managed by people that have little or no business experience. When the business management of the conference is unacceptable, attendees can become disgruntled. These individuals often proclaim that they will never attend that conference again when the food is cold, the rooms are too hot, the bathrooms are crowded or closed, the taxi ride cost too much, and so on. There is a real need to have a management team that understands business and the basics of event planning and to have those people involved in the technical program stay within their technical expertise.

Paper Evaluation Much of this discussion has been devoted to selecting conference papers of high quality. A legitimate fear of any conference organizer is to discover that a very poor or possibly bogus paper has been accepted and published because of a lack of due diligence. In fact, the latter incident already occurred in 2005 when a randomly generated paper was accepted and appeared in the proceedings of the World Multi-Conference on Systemics, Cybernetics and Informatics [7]. In addition to previously suggested measurements, one way to improve the quality of a conference is to establish a solid refereeing system by requiring, for example, that each paper be viewed by at least two referees. More rigorous refereeing, however, is likely to lead to lower paper acceptance rates. At the lower end of the conference-quality spectrum are those conferences that accept papers for presentation

and publication on the basis of a one-half-page abstract. Once the abstract has been looked at by the conference chair, there may be no further vetting of the paper.

High-Quality Data Files Conference papers that follow the IEEE specifications for Xplore-compliant PDF (Portable Document Format) files have the advantage of being easily posted in a timely fashion into digital libraries. Fast posting is becoming increasingly important since timeliness in posting can affect impact factors and usage for papers. The IEEE launched an online source file conversion tool in 2007 called IEEE PDF eXpress. IEEE-sponsored conferences that are participating in the Conference Publication Product program can make use of the PDF eXpress tool at no charge.

Ideally, authors submitting to conferences that publish with the IEEE should take the time to load the document properties dialog box of the PDF file they are submitting as their final paper with a refined set of metadata about their paper. Or, at a minimum, they should make sure the document properties reflect the correct paper title, author names, and conference name. This information will be picked up by internet search engines and might possibly improve the search-results ranking of the paper. However, authors should avoid the practice of overloading the metadata in an attempt to drive up their paper's search ranking. Overloading the metadata can have the opposite effect.

Plagiarism Detection Plagiarism is a significant problem for technical conferences for a number of reasons. Conference papers generally have to be refereed rapidly. There is also the economic incentive to accept papers to increase paid registrations. Finally, the internet has made it exceedingly easy to copy material from a great variety of sources. It is quite possible to copy complete papers and submit them to conferences, replacing only author names and institutions. Our work on the IEEE PSPB has shown us that this situation has occurred in IEEE publications and, in a few cases, has escaped detection in the refereeing process.

Since plagiarism is a serious problem, it can best be emphasized by the following real incident. A conference submission was found to contain text from a previously published conference paper. This incident led to an investigation into the level of plagiarism that had occurred. During the investigation process, it was found that the paper contained text from a second paper, and then another one, until a total of six sources were found from which 90% of the paper had been copied. It would have been bad enough if the incident had stopped at this point, but it did not. Among the six sources plagiarized, it was found that one of these sources plagiarized yet another.

Fortunately, the internet, which makes it easy to perpetrate plagiarism, can be used to combat fraud as well. For example, both instances of plagiarism previously mentioned were found with an internet search and with online databases. Using such tools at the front end of an automated paper-submission process might defeat—or at least deter—many literary thefts that can damage a conference's reputation [8], [9].

A related problem is the republication of the same material from one conference to another conference or republication of a conference paper into a journal article. As noted before, the PSPB Ops Manual rules state that the republication of a conference paper in a serial publication is only acceptable if it contains at least 30% new content.

Other Risks Other risks that have been encountered by every conference organizer include low attendance, a high rate of presenter absenteeism, financial failure, and the poor quality of presentations. While these are very real considerations for producing and sustaining successful conferences, further discussion of these issues is considered out of the scope of this discussion.

RECOMMENDATIONS

This discussion has highlighted the problems associated with conference perceptions and realities with respect to the primary end product: the conference proceedings. The conclusion is that there are no generally acceptable metrics for the quality of the conference proceedings nor the papers published therein. Further, there are no established lower bounds for acceptability of conference parameters, such as acceptance rates, refereeing processes, and so on. Nevertheless, the collective experiences of the authors as conference attendees, as organizers, and as members of a committee that oversee an operation that produces hundreds of proceedings each year permit the offering of some preliminary best practices that can lead to improvement in conference quality.

Track Paper Acceptance Rates With respect to paper acceptance rates, for the reasons previously

described, no magic number is offered. It has already been noted that many conferences have a 20–50% paper acceptance rate. This range seems reasonable. What is more important, however, is to track acceptance rates over time. Tracking acceptance rates allows program committee members to identify situations in which acceptance rates seem abnormally low or high relative to other years for the purposes of identifying and correcting the reasons for any aberration. Furthermore, by tracking paper acceptance statistics and other relevant data, such as author affiliations and geographical distribution, correlations may be made between these data and other phenomena, such as attendance rates and author absenteeism, for the purpose of taking corrective actions.

Rotate the Members of the Conference Management Whatever structure is chosen for conference management, it is important to ensure an influx of new ideas and energy each year. New conference leaders often bring with them new pools of paper referees who can help invigorate the review process.

Many journals enforce term limits of three to five years for editors and associate editors. Such rotation, even with a one-term renewal, is recommended in the PSPB Ops Manual. A similar rotation schedule is also desirable for a conference-management committee.

Ensure Proper Review of Papers All conference papers should be reviewed by at least two blind, independent reviewers. "Blind" means anonymous to the authors of the paper. "Independent" means that the reviewer is not a close associate of the authors, at least as determined by affiliation or other common-sense rationale. Conference-management (program committee) members are usually expected to be reviewers also, but drawing from outside the conference-management structure for reviewers is preferable since it promotes independence and reduces reviewer fatigue. In the case of two opposed reviews, a third independent review is desirable. While the tie can be broken by the conference technical chair or conference committee member handling paper submissions, this type of decision is tantamount to a unilateral one. That is, when an editor is faced with one "yes" recommendation and one "no" recommendation from reviewers concerning acceptance, if the editor chooses to break the tie, then he or she might as well have made the decision from the outset. The correct solution is to seek a third independent review.

Use Conference Organizing Tools Commercial and open-source software tools that can be helpful in organizing conferences, managing the paper review process, and even in preparing files for final publication have been available for many years [10]. These tools can contribute to paper quality by decreasing the possibility of reviewers and editors reviewing each other's papers and by greatly decreasing the possibility of plagiarism or multiple submissions. Tools can also be improved to check formatting, spelling, grammar, image quality, and other characteristics of the submitted paper.

It is inappropriate to nominate any tools here, but there are so many available that future work should be focused on an objective comparison of these tools. In any case, conference organizing software can help manage the review process, ease the collection of relevant statistics, avoid reviewer overload, and even avoid reviewer conflict by checking for cross-linking of authors and reviewers. That is, it can help avoid a situation in which Author A reviews Author B's paper while Author B reviews Author A's paper.

Use Plagiarism Detection Tools There are commercial tools that can be purchased or used in a software-as-a-service model to help identify plagiarized text. These tools are highly effective, but can be costly, especially for small conferences. There are open-source solutions, and customized solutions can be built if sufficient expertise is available. However, simple text-based searches using standard web search engines can be highly effective to spot-check papers.

Whatever tools or informal techniques are used, a clear statement prohibiting plagiarism should be made in all conference calls for papers, and a clear policy should exist stating what should be done in the circumstances where plagiarism is confirmed. In fact, papers published under the copyright of the IEEE must abide by the PSPB Ops Manual (amended November 19, 2006), as follows:

> Papers presented at the IEEE meetings sponsored wholly or in part by any IEEE Organizational Unit may be published in IEEE Conference Records or Proceedings. Prior permission to do so shall be obtained from the sponsoring IEEE Organizational Unit who shall be responsible for ensuring that the appropriate IEEE copyright (see Section 8.1.4) is obtained for each published paper and that the publication is correctly titled. (See Sections 8.1.5 and 8.1.6.) Conference publications may require peer review as specified by Section

> 8.2.2.B. Allegations of misconduct by authors of the papers in IEEE conference proceedings shall be investigated by the publication's editor (i.e., the person responsible for the conference publication), or by the Publication Officer of the IEEE Organizational Unit that sponsored the conference if the allegation is made after the publication of the conference proceedings. The procedures prescribed in Section 8.2.4 shall be used in any such allegation involving conference proceedings. [1, p. 75]

Have a Clear Format for Papers Having a standard format for the submission of papers and enforcing the format make the preparation of the proceedings document and associated metatagging far easier. Consistently formatted submissions are also easier for reviewers to handle and for automated plagiarism detection tools to check. (For example, it is much harder to check for plagiarism in a PDF file versus searchable text.) Providing appropriate templates and text conversion tools to authors will ensure that submissions are made in the appropriate format.

Have a Policy to Deal with Poorly Written, but Otherwise Viable Papers Sometimes, for whatever reason, a paper is submitted to a conference in which the reviewers determine that the quality of the research is acceptable, but the written presentation of the results is unacceptable. Various strategies can be adopted, such as outright rejection, accept with major rewriting, and provision of editorial services for a fee through the conference. Another possibility is for the conference organizers to allow conference participants to give presentations without submitting a paper to the proceedings. This strategy might work well with in-progress research or with paper submissions that clearly need additional work but have merit worthy of presentation. Whatever policy is implemented with respect to poorly written submissions, the policy should be published and disseminated so that it can be easily found by prospective authors. These policies should be enforced fairly and uniformly.

Learn to Deal with No Shows Conference attendance and, hence, perceived conference quality can be affected by too many no-show speakers. No-show speakers can be the victims of visa or travel problems, or they can simply be exploiting the system to get papers published in a conference proceedings without actually attending the conference. Although this issue was not discussed at length in this paper, it is recommended that any high-quality conference should have a clear policy with regard to nonattendance and that this policy should be consistently enforced.

Establish and Disseminate Policies and Practices It has been noted several times that all conference policies and practices ought to be documented and made known to all members of the conference community. In addition to posting these items on the conference website and in printed matter, it is appropriate to prepare a manual for conference organizers that can be updated continually. Such a manual will assist new conference organizing committee members as they come on board, delineate the process and, thus, generate conference improvement and help maintain consistency and fair play during the lifetime of the conference.

Failing to adopt a set of meaningful best practices regarding conference publishing and overall conference management can lead to degradation of conferences, conference papers, and an erosion of the reputation of the published material in the digital libraries that host these publications. In the worst case, these poor conferences impede research progress.

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